TABLE 2.—*Free-air resultant wind directions and velocities (m. p. s.) during November, 1922.*

Altitude, m. s. l. (m.)	Broken Arrow, Okla. (233m.)				Drexel, Nebr. (396m.)				Due West, S. C. (217m.)				Ellendale, N. Dak. (444m.)				Groesbeck, Tex. (141m.)				Royal Center, Ind. (225m.)			
	Mean.		5-year average.		Mean.		8-year average.		Mean.		2-year average.		Mean.		5-year average.		Mean.		5-year average.		Mean.		5-year average.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Surface	S. 40° W.	1.4	S. 40° W.	1.1	S. 73° W.	2.7	S. 87° W.	1.4	N. 72° W.	2.6	N. 84° W.	2.2	N. 35° W.	3.0	N. 44° W.	2.2	N. 61° E.	0.9	N. 41° E.	0.3	S. 46° W.	3.5	S. 55° W.	2.6
250	S. 38° W.	1.5	S. 34° W.	1.2	.....	.....	.....	.....	N. 81° W.	1.9	S. 88° W.	1.8	.....	.....	.....	.....	N. 65° E.	1.7	N. 78° E.	0.6	S. 46° W.	4.0	S. 52° W.	2.8
500	S. 28° W.	2.5	S. 21° W.	2.2	S. 75° W.	3.3	S. 87° W.	2.0	S. 74° W.	0.9	S. 74° W.	1.6	N. 41° W.	3.1	N. 55° W.	2.3	N. 88° E.	2.9	S. 33° E.	0.9	S. 58° W.	6.4	S. 53° W.	4.6
750	S. 30° W.	3.5	S. 25° W.	3.2	S. 81° W.	4.4	S. 89° W.	3.5	N. 86° W.	1.4	S. 78° W.	2.3	N. 43° W.	4.7	N. 55° W.	3.5	S. 79° E.	3.0	S. 15° W.	1.3	S. 62° W.	8.0	S. 60° W.	6.2
1,000	S. 50° W.	4.5	S. 38° W.	3.7	S. 86° W.	5.9	S. 84° W.	4.8	N. 86° W.	2.7	S. 82° W.	3.1	N. 49° W.	5.7	N. 62° W.	4.3	S. 69° E.	2.2	S. 44° W.	2.1	S. 66° W.	9.2	S. 65° W.	7.2
1,250	S. 55° W.	5.4	S. 48° W.	4.6	S. 87° W.	6.9	N. 89° W.	5.7	N. 89° W.	3.9	S. 87° W.	4.6	N. 56° W.	6.2	N. 66° W.	5.0	S. 28° E.	0.7	S. 59° W.	3.0	S. 71° W.	10.1	S. 68° W.	8.2
1,500	S. 54° W.	6.3	S. 57° W.	5.1	S. 79° W.	8.3	N. 88° W.	6.8	S. 87° W.	5.5	S. 88° W.	6.0	N. 62° W.	6.7	N. 66° W.	6.3	S. 39° W.	2.1	S. 67° W.	4.0	S. 73° W.	10.9	S. 71° W.	8.8
2,000	S. 62° W.	5.9	S. 64° W.	6.9	S. 84° W.	10.1	N. 84° W.	7.7	S. 85° W.	7.2	S. 86° W.	8.4	N. 63° W.	8.5	N. 66° W.	8.2	S. 56° W.	4.4	S. 69° W.	5.7	S. 83° W.	12.1	S. 78° W.	10.3
2,500	S. 73° W.	7.3	S. 73° W.	7.7	N. 87° W.	11.7	N. 81° W.	9.4	S. 81° W.	9.6	S. 82° W.	10.5	N. 59° W.	12.0	N. 65° W.	11.1	S. 66° W.	5.9	S. 84° W.	7.5	S. 84° W.	13.1	S. 80° W.	12.4
3,000	S. 64° W.	9.6	S. 72° W.	9.6	S. 87° W.	13.5	N. 79° W.	10.7	S. 88° W.	12.7	S. 85° W.	13.8	N. 57° W.	12.5	N. 66° W.	12.9	S. 62° W.	8.2	S. 83° W.	9.0	N. 87° W.	13.0	S. 88° W.	14.1
3,500	S. 62° W.	11.2	S. 70° W.	10.1	N. 75° W.	12.6	N. 76° W.	11.4	S. 84° W.	13.8	S. 86° W.	14.7	N. 53° W.	13.5	N. 65° W.	13.8	S. 56° W.	9.8	S. 69° W.	11.4	N. 74° W.	19.4	N. 89° W.	12.9
4,000	S. 70° W.	11.0	S. 77° W.	11.8	N. 83° W.	14.6	N. 80° W.	13.3	N. 81° W.	17.7	N. 82° W.	16.3	N. 68° W.	15.3	N. 62° W.	12.4	S. 18° W.	9.2	S. 64° W.	9.3	.....	.....	.....	.....
4,500	S. 58° W.	11.4	S. 61° W.	14.2	N. 79° W.	16.2	N. 86° W.	14.5	W.	19.3	N. 76° W.	18.0	N. 68° W.	16.8	N. 50° W.	15.7	S. 28° W.	9.3	S. 62° W.	9.7	.....	.....	.....	.....
5,000	S. 45° W.	12.3	S. 45° W.	12.3	S. 45° W.	18.6	S. 85° W.	15.6	.....	.....	.....	.....	.....	.....	.....	.....	S. 22° W.	7.5	S. 68° W.	10.1	.....	.....	.....	.....

THE WEATHER ELEMENTS.

By P. C. DAY, Meteorologist, in Charge of Division.

PRESSURE AND WINDS.

During November the continental high pressure, common to the colder period of the year, usually assumes a more definite type than is apparent during the preceding month, and the somewhat permanent high areas over the southeastern States and in the far Northwest increase both in area and magnitude. At the same time there is a general increase in pressure over that existing during October in practically all portions of the country. The only exception to this is found over extreme northwestern Washington, where the increasing storm activity, due to the approach of winter, tends to reduce the average pressure below that of October.

For the present month pressure in both Canada and the United States was everywhere greater than during the preceding month, and the differences were distinctly larger than is usually the case, particularly over the far Northwest and to a somewhat less extent in all southern districts. Pressure averages were likewise well above the normal over all western and southern districts, but they were slightly less than normal over portions of the upper Mississippi Valley, Lake region, and to the eastward.

While changes in atmospheric pressure were rapid and cyclones and anticyclones moved across portions of the country at more frequent intervals than is usual, the pressure gradients were mainly insufficient to produce high winds. On the morning of the 4th, however, a storm that had moved from northern Arizona and southern Utah to southeastern Colorado during the preceding 24 hours developed conditions favorable for local high winds in the middle Plains and adjacent regions during that and the following day, a severe tornado being reported from eastern Colorado on the 4th, attended by the loss of several lives and heavy damage to property. (A more complete account of this storm will be found on page 605 in this REVIEW.)

Some high winds occurred over the North Atlantic coast sections during the last decade of the month, and at the close a severe storm was approaching the Great Lakes, and high winds prevailed from the lower Missouri Valley to the Lake Superior region.

The high-pressure area over the Southeastern States had its center of greatest pressure in the southern Appalachian Mountain district and greatly influenced the prevailing winds to eastward of the Mississippi River, the winds around the central high area assuming the usual anticyclone movement. Likewise there was the usual movement around the high area central over the northern Plateau and northern Rocky Mountain region. The prevailing winds were usually from the northwest in the upper Missouri Valley and from southerly points in the middle Plains. In the far Southwest and in central and southern Texas they were mainly from northerly points.

TEMPERATURE.

As was the case in October, the outstanding feature of the weather of the month was the continued absence of uncomfortable cold over the districts from the Rocky Mountains eastward until near the end. Over the more western districts, however, the weather was nearly continuously colder than normal during most of the month.

The first week of the month had temperatures above the normal from the middle portion of the Great Plains eastward to the Atlantic coast, the period being particularly warm in the great central valleys. West of the Rocky Mountains cold weather persisted, the weekly averages ranging from 6° to 9° daily below the normal over much of the Plateau region.

During the second and third weeks temperature conditions remained much as in the first week, though not quite so warm over the eastern districts and slightly colder than the preceding week in the central and northern Rocky Mountain regions.

The last week of the month brought a general reversal of temperature conditions, the averages falling below normal in the districts to eastward of the Mississippi River for the first time in a number of weeks, but continuing unusually warm in the Missouri Valley and adjacent areas. The week continued cool in the far Northwest, where almost constant cold had prevailed during the preceding portions of the month.

The average temperature for the month as a whole was above normal in practically all portions of the United States and Canada to eastward of the Rocky Mountains, and decidedly so from Kansas and Missouri northward, where the monthly means ranged from 5° to 10° above

normal. West of the Rocky Mountains the month was, generally speaking, cold and disagreeable. At some points the temperature remained below normal throughout nearly the entire 30 days and the averages were among the lowest of record for November.

The warmest periods of the month were during the first few days over the greater part of the country, although warm periods occurred in other parts of the month, but generally during the first two decades. Maximum temperatures above 90° were observed in most of the Southern States, while in some of the Northern States they did not rise higher than 70°.

Minimum temperatures were not unusually low as compared with November of some previous years, the lowest for the month occurring usually during the last decade. Freezing temperatures were reported from all the States, and readings below zero were reported from practically all the western Mountain States. The lowest observed, −23°, was reported from the mountain districts of Colorado.

PRECIPITATION.

The marked shortage of precipitation that had persisted during much of September and October over extensive areas in the central and eastern portions of the country continued throughout November in most of the States from the Mississippi River eastward.

While this shortage of moisture fortunately was not materially injurious to vegetation, due to lateness of the season, save in some of the trucking districts of the South Atlantic and East Gulf coast regions, the domestic supply of water was becoming alarmingly low in some of the more eastern districts. Farmers in many localities were compelled to haul water for both household and stock needs, the water supply of many cities was greatly depleted, and power plants and factories depending on water were being greatly inconvenienced by the diminishing supply. In portions of Pennsylvania, particularly the more eastern portions, the precipitation during the month was the least that has occurred in November for a hundred years or more, and the combined precipitation for the four months August to November, inclusive, of the present year was also the least for these four months in a like period.

At Charleston, S. C., it was the driest November in more than 50 years, and a number of stations in that State, as well as in Georgia and Florida, reported an entire absence of rainfall during the month.

While precipitation was markedly deficient over the more eastern sections, those immediately west of the Mississippi River and extending thence to the Rocky Mountains, had in the main abundance of moisture, and in certain localities too much for present needs. In portions of the Great Plains region the precipitation was the heaviest for November in 50 years or more, the amounts in the central and eastern portions of Kansas and Oklahoma ranging up to 6 to 8 inches and in a few cases to nearly 10 inches.

In the far southwestern districts precipitation, though not so heavy as farther east, was nevertheless mainly above normal, and in some instances materially so. In portions of New Mexico the first appreciable precipitation since June occurred, relieving somewhat the water shortage that had existed so long.

In the far Northwest precipitation was sufficient for present needs, but the total falls were mainly less than normal, and in portions of Washington the month was the driest November of record.

The greatest precipitation for the month occurred in extreme southern Louisiana, where nearly 18 inches were measured. No precipitation occurred at a few points in Georgia, Florida, California, and Nevada.

SNOWFALL.

The snowfall of November was generally not heavy, especially to eastward of the 100th meridian. However, in parts of the Rocky Mountain States, the Dakotas, and western Nebraska there were some heavy falls early in the month, particularly on the 4th and 5th, when the falls over eastern Wyoming, western South Dakota, and adjacent districts were unusually heavy. In the Black Hills region the depths ranged from 3 to 4 feet on the level, and much loss of live stock resulted. At Lander, in central Wyoming, from the snowfall late in October the ground remained constantly covered till well into December, owing largely to the decidedly low temperatures that prevailed and to the moderate additional falls that occurred. This snow cover necessitated an unusual amount of feeding for the time of the year. In the Sierra of California some heavy snowfalls occurred from the 6th to 10th. At Summit, elevation 7,017 feet, 6 feet of snow was measured during that period, and there were greater falls at some of the higher elevations.

Over the upper Mississippi Valley and the districts to eastward there was considerably less snowfall than the November average, except in a few small areas. During the cold weather of the closing week a little snow and sleet, usually less than 2 inches, fell over the south-central portions of Alabama and Georgia, reaching some points where snow had not previously fallen for a long period.

For the month, as a whole, snow occurred over the greater part of the country, although the amounts east of the Rocky Mountains were mainly surprisingly small considering the wide extent of its occurrence.

RELATIVE HUMIDITY.

Despite the generally dry conditions existing during the month from the Ohio and lower Mississippi Valleys eastward, including New England, and the unusual warmth that prevailed in the same region during the greater part of the month, the average relative humidity was not materially lower than normal; in fact, over some of the drier regions of the Southeast the percentages were locally above normal. In the trans-Mississippi region relative humidity was mainly greater than the normal, the percentages being unusually high in the western Plains and Rocky Mountain districts. On the immediate Pacific coast the relative moisture content of the atmosphere was distinctly less than normal.